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The natural resources supply indexes study of the pig breeding scale in China

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Abstract. For the pollution problem of the pig breeding scale, we took three indexes as evaluation criterion, including arable land per capita, the water resource per capita and per capita share of grain. Then SPSS was used to synthesized the natural resources supply indexes of the pig breeding scale. The results show that with the fast development of technology and the steadily rising of grain production, the natural resources supply indexes of the pig breeding scale are raising constantly.

1. Introduction

According to China's Statistic Bureau, pork production plays a predominant role in animal husbandry. The production of pork, beef, mutton and poultry meat is about 84 million tons, thereinto, pork production is 5299000 tons, the proportion of it is as high as 63.35%. Nowadays, China's pig industry is promoting fast towards large scale, intensification and standardization. The NO.1 document from the national central government in 2017 stresses that "implement green production mode, and enhance the ability of sustainable development". Moreover, it also made a point that "Vigorously promote efficient ecological cycle of planting and culture mode, accelerate the centralized processing of animal dung, and implementation large scale bio-gas develop healthily. Not only does it indicate the seriousness of the scale breeding pollution, it also manifests the Party Central Committee and the State Council attach great importance to scale breeding pollution problem. For the reason, the paper studies on the natural resources supply indexes of the pig breeding scale.

2.Index calculation

Water resource, cultivated area and grain are important natural resources in pig breeding scale. Thus, we adopt arable land per capita, the water resource per capita and per capita share of grain as resources supply indexes of the pig breeding scale. Then we use SPSS and factor analysis to evaluate these indexes. In accordance with China statistical Yearbook, the standardized value of natural resources supply indexes are as follows.

Chart 1. The standardized value evaluation of natural resources supply indexes

Year	The dimensionless processing value of cultivated per capita C11	The dimensionless processing value of water resources per capita C22	The dimensionless processing value of grain per capita C33
2006	0.98	0.84	0.84
2007	0.91	0.83	0.84
2008	0.90	0.90	0.88
2009	1.00	0.79	0.88
2010	0.99	1.00	0.90
2011	0.98	0.75	0.94
2012	0.98	0.95	0.96
2013	0.98	0.89	0.98
2014	0.97	0.87	0.98
2015	0.97	0.88	1.00

We conduct a descriptive analysis about natural resources supply indexes. Then we get chart 2.

Chart 2. Descriptive statistics

	N	Minimum	Maximum	Average	Standard deviation
C11	12	0.90	1.00	0.9692	0.03118
C22	12	0.75	1.00	0.8692	0.07166
C33	12	0.80	1.00	0.9017	0.06900

Based on the data in chart 2 and chart 1, we can find there have been a sharp decrease of the per capita arable land area in China over recent decades, it reduced from 0.09893 HA/person in 2006 to 0.09821 HA/person in 2015. The standard deviation of three indexes are small, it shows the samples distribute centralized and the degree of dispersion is low. The decrease range is in conformity with the arable land per capita in chart 1. The per capita water resources decreased between 2006s and 2007s, but it got some reversion after 2011s. However, there was more substantial decrease between 2009s and 2011s. According to the coefficient of standard deviation, the numerical value is big, it shows the dispersion degree is high, the distribution of samples are relatively fragmentary. The per capita grain yield has been increased progressively in recent decades. Its standard deviation is large, and dispersion degree is high.

3.The natural resources supply indexes evaluation of the pig breeding scale in China

We make use of factor analysis analyzing the natural resources supply indexes. First, we analyze the correlation among the natural resources supply indexes, then the adaptability of indexes are checked out. We get the correlation matrix of original variables as chart3.

Chart 3. The correlation matrix of original variables

		C11	C22	C33
Correlation	C11	1.000	0.000	0.357
	C22	0.000	1.000	0.199
	C33	0.357	0.199	1.000

Based on chart 3, we can find the three original variables have some correlation, it shows they are suited for factor analysis. Thus, we can conclude the variance contribution rate of factors in chart 4.

Chart 4. The variance contribution rate of factors

Component	Initial eigenvalues			Quadratic sum loaded			Rotate quadratic sum loaded		
	Total	Variance %	Add up %	Total	Variance %	Add up %	Total	Variance %	Add up %
1	1.409	46.959	46.959	1.409	46.959	46.959	1.346	44.880	44.880
2	1.000	33.333	80.293	1.000	33.333	80.293	1.062	35.412	80.293
3	0.591	19.707	100.000						

After extracting these factors, the results show that the variance of factor are high, so those factors extracted can describe the three indexes well. In accordance with the analysis results of factor variance contribution rate in chart 4, the variance contribution rate of factor 1 is 46.959%, and the eigenvalue is 1.409. The variance contribution rate of factor 2 is 33.33%, and the eigenvalue is 1.000. The two indexes account for 80.293%, so we extract the first two component as the first and the second component. Then we get the component matrix as chart 5.

Chart 5. Component matrix

	Component	
	1	2
C33	0.839	0.000
C11	0.733	-0.487
C22	0.409	0.873

The first column in the chart shows the correlation of the first main component and the related variables. Component matrix is also known as factor loading matrix, loading coefficient refers to the correlation between factors and variables. In the matrix, the larger the loading coefficient is, the stronger the explanatory power of original variable is. The computation is put on chart 6.

Chart 6. Component score coefficient matrix

	Component	
	1	2
C11	0.669	-0.245
C22	-0.074	0.917
C33	0.548	0.233

Component 1 is indicated as F1, component 2 is indicated as F2. Then we educe expressions of both components:

$$F1=0.669*C11-0.074*C22+0.548*C33$$

$$F2=-0.245*C11+0.917*C22+0.233*C33$$

Then normalization processing is carried out. The variable contribution rate of the two components is processed from（46.959%, 33.333%） into（58.49%, 41.51%). Regarding the variable contribution rate as weight, we can obtain the equation about natural resources supply indexes B1:

$$B1=58.49\%*F1+41.51\%*F2$$

The analysis results are shown in Figure 1.

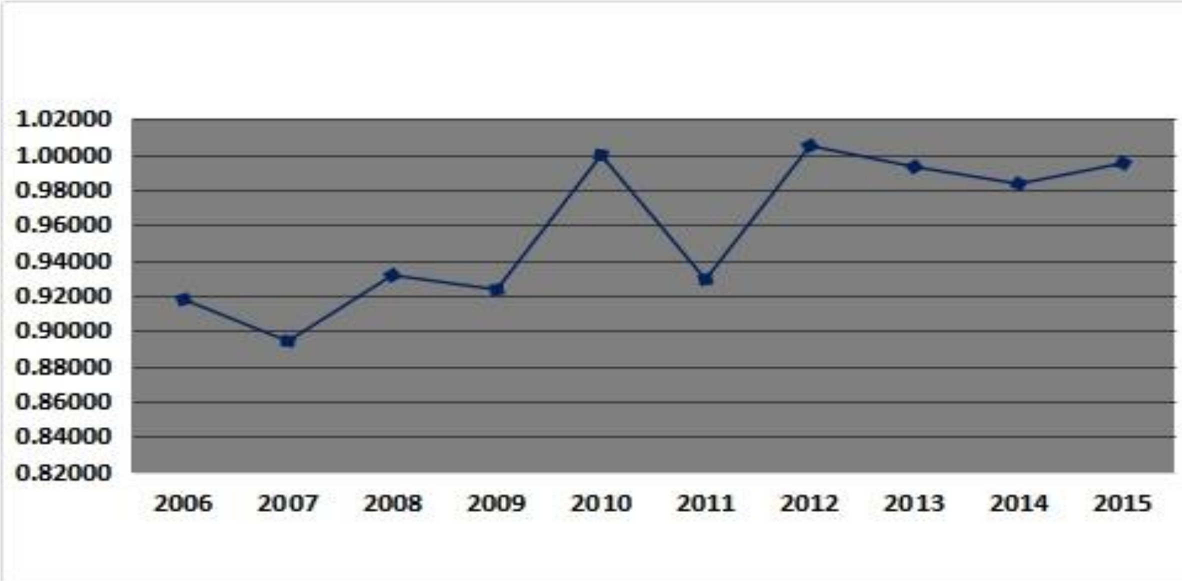

Figure 1. The natural resources supply in pig breeding scale

It is observed that although land arable per capita is decreasing ceaselessly, the spontaneous supply capacity is heightening. It comes from the advance of technology and the steady rise of grain production.

4.Conclusion

For one thing, we adopt land arable per capita, per capita water resources and per capita grain yield as evaluation standards of natural resources supply indexes of the pig breeding scale in China. For another, we take use of SPSS studying these indexes. The consequence shows that the natural supply ability in China is enhanced constantly on the whole. It mainly thanks to the development of technology and the stable improvement of grain production.

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